DOCUMENT RESUME

ED 418 740 JC 980 200

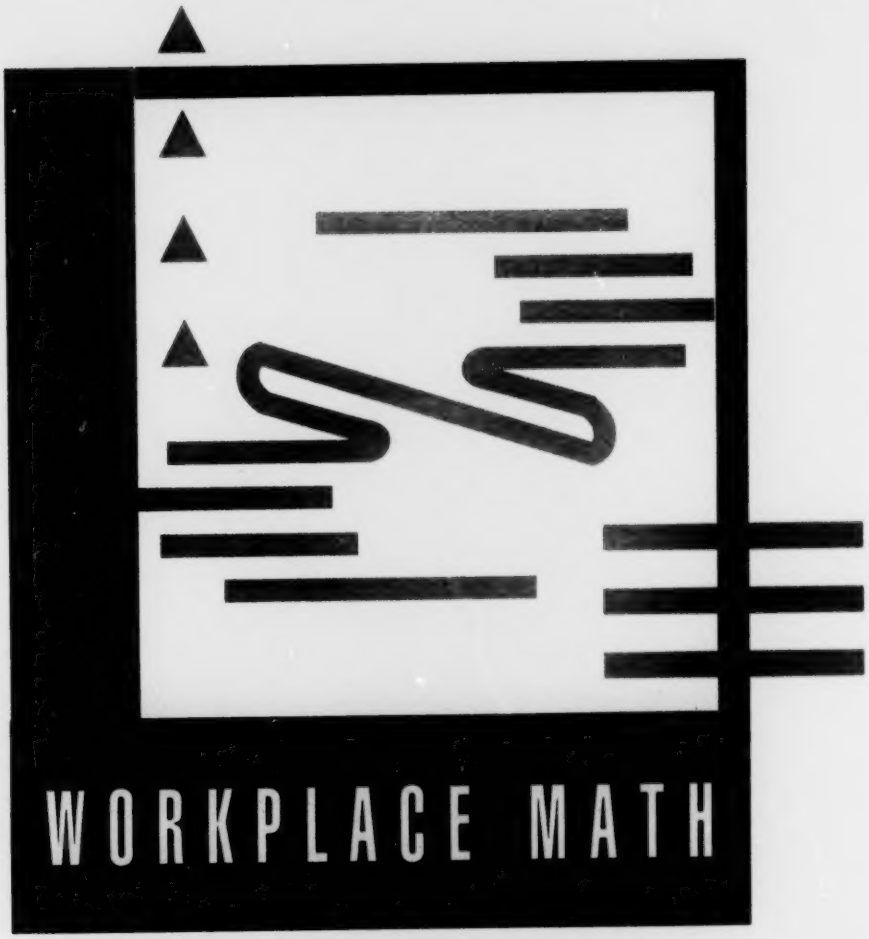
AUTHOR	King, Catherine; Cyr, Anne Reis; Gross, Mary; Armstrong, Ray
TITLE	Workplace Math. EPIC Workplace Learning Project, 1996.
INSTITUTION	Colorado Community Coll. and Occupational Education System, Denver.
SPONS AGENCY	Department of Education, Washington, DC.
PUB DATE	1996-00-00
NOTE	77p.
PUB TYPE	Guides - Classroom - Teacher (052)
EDRS PRICE	MF01/PC04 Plus Postage.
DESCRIPTORS	Adult Basic Education; Basic Skills; Class Activities; *Instructional Materials; *Learning Activities; *Mathematics Anxiety; *Mathematics Instruction; Mathematics Skills; *On the Job Training; Teaching Guides; Teaching Methods

ABSTRACT

Designed as a reference for teaching mathematics in the workplace, this manual presents teaching strategies and activities for beginning, intermediate, and advanced learners in four mathematics-related topics. Following an overview of the manual's purpose, definitions are provided of the three skill levels targeted by the activities. Strategies and activities are then presented for the first topic, easing math anxiety, including methods for recognizing anxiety and identifying realistic expectations, a skills self-assessment form, activities for counting and estimating, and strategies for teaching and understanding word problems. The next section focuses on working with whole numbers and includes activities related to reading and writing large whole numbers, assessing place values, and writing mathematical sentences. The following section presents strategies and activities related to teaching fractions and decimals, including activities to teach students to read and write decimal numbers, understand fractions through the use of pizzas, comprehend improper fractions, and master the use of percent signs. The final section focuses on teaching percentages and rates and includes activities related to calculating rates and bases, using salaries and shopping to teach percentages, creating budgets and frequency distributions, and making pie charts. (BCY)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 418 740



U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

IC980200

Colorado Community College and Occupational Education System

US Department of Education

BEST COPY AVAILABLE

Table of Contents

OVERVIEW

SKILL LEVEL DEFINITIONS

ACTIVITY TOPICS

Simple Ways to Ease Math Anxiety - A True Beast Lurking in Your Classroom

1 Recognizing Math Anxiety
2 Identifying Realistic Expectations
3 Basic Math Skills Self-Assessment
4 M&M Game
5 Counting and Estimating
6 Problem Exchange
7 Understanding Word Problems

Working with Whole Numbers

1 If I Won the Lottery, Could I Read the Prize Amount?
2 Writing Whole Numbers Correctly
3 Place Value Assessment
4 Writing Mathematical Sentences

Fractions and Decimal Numbers - Bit-by-Bit

1 Reading Decimal Numbers
2 Writing Decimal Numbers
3 Pizza Pie & Fractions
4 Understanding Improper Fractions
5 Measuring Teams
6 Signs, Signs, Everywhere are Signs: Dropping Percent Signs
7 Adding Percent Signs

Percentage Power

1 Working with Percents
2 Calculating the Amount
3 2 out of 12 Students Fall Asleep during Class - Calculating Rates
4 Calculating the Base
5 Using all 3 Basic Percent Formulas
6 What's My Pay?
7 Shopping the Sales
8 Looking at Your Budget
9 Frequency Distributions
10 Inedible Pies: Making Pie Charts

OVERVIEW

Mathematics can be viewed as an exact science. For example, a student practicing math in the United States should get the same answer as a student in China. Thus, the field of mathematics has a fundamental worldwide application.

Since mathematics has a variety of applications, it would be impossible to attempt to cover them all. The focus of this manual is to include mathematical concepts used in the workplace. The workplace has become more and more technical in nature and many of the new technological advances have mathematics in their makeup. Therefore, a fundamental knowledge of mathematics has become a necessity for the modern day worker.

This manual includes some of the teaching secrets we have found successful as well as containing some of the more traditional methods. This manual is designed to be used as a reference resource. The instructor can pick and choose from a variety of activities as well as teaching styles to find what works best for that person or class setting. The order of activities is random and each activity is designed to be used independently or in conjunction with any other activities the instructor already has in their repertoire.

Workplace mathematics may involve a wide variety of skill levels and this manual is designed to have something for everyone. The manual is devised to help you teach to a full range of students, from refresher students to new students just beginning their math journey, using a variety of teaching styles to help today's employees succeed in their jobs. However you add it up - math can be a challenging and an exciting experience for both students and instructors alike!

Contributing Authors:

Catherine King, Pikes Peak Community College
Anne Reis Cyr, Community College of Denver
Mary Gross, Morgan Community College
Ray Armstrong, Trinidad State Junior College

MATH ANXIETY

SKILL LEVEL DEFINITIONS

The categories below serve as guides for instructors unfamiliar with a particular activity. It is difficult to accurately label an activity as Beginning, Intermediate, or Advanced because so much of the activity's success depends on the cognitive abilities of the students. The module has not attempted to categorize specific topic areas in terms of difficulty, but rather provide activities illustrating all three skill levels within each topic area. Hence, users of the module will find "Beginning" level activities within topic areas generally considered more advanced as well as "Advanced" level activities within topic areas generally considered basic. Therefore, it is left to the instructor's discretion which activities are best suited for a specific purpose or group.

The arrangement of activities within each section is random rather than prescriptive and does not suggest a sequential order of presentation. If the success of one activity depends on the previous presentation of another activity, it is indicated. Otherwise, choose the activities in the order that best suits the needs of the class or workshop.

- ● **BEGINNING:** These activities typically provide an introduction to a mathematical concept. They tend to be teacher-directed in presentation and rely on demonstration of the concept. Practicality and relevance of the topic area are stressed. Students may be asked to perform simple computations.

- ■ **INTERMEDIATE:** These activities provide students the opportunity to reinforce the skills previously demonstrated. Students may be asked to solve problems requiring knowledge of the basics as well as the conversion from one system to another.

- ▲ **ADVANCED:** These activities allow the students to apply what they have learned solving mathematical problems of complex nature. Students may be asked to synthesize their own knowledge to tackle problems involving multiple operations.

Simple Ways to Ease Math Anxiety

As most math instructors realize, a phobia known as math anxiety truly exists and makes its presence known in our classrooms - sometimes rearing its ugly head! Most students appreciate the opportunity to discuss their qualms, especially if this is the first math class they have taken in a number of years. Sharing personal anxieties or previous classroom experiences sometimes helps the students open up and provide insights of their own. Found within this section are handouts that provide examples of math anxiety symptoms and provide an opportunity for classroom discussion to take place. Instructors will also find some low anxiety level exercises that can help create a productive, stress-free learning environment.

RECOGNIZING MATH ANXIETY

Learning Goals:

- Create a comfortable math setting
- Identify math anxiety symptoms
- List individual symptoms

Level: ●

Group Size: Any

Time: 15 minutes

Preparation and Materials: Overhead *Math Anxiety Symptoms*
Handout *Assessing Personal Math Anxiety*

Learning Activity:

Many people go through life experiencing true anxieties when dealing with mathematical concepts. Math anxiety can be displayed both emotionally and physically and there are many different symptoms. Begin with the overhead that illustrates some of the common symptoms. Maintain an open discussion and have students contribute to the existing list. Have students complete the handout.

***Discussion Questions**

1. If you were presented a math test at your workplace, what would be your initial response?
2. Do you believe that one has to be fast at math to be good at math?
3. Do you think that people good at math have math anxieties?

***Variations** Instructor could begin class with an empty list of anxiety symptoms and have students create the list from scratch.

Remarks: It is important to allow students to realize that they are not alone when it comes to math anxiety. We have all encountered some type of math experience in our adult lives that has made us feel uncomfortable. Some experts feel that math anxiety is a learned behavior and can be changed. Lack of confidence in our math abilities hinders our successes and as instructors we must take the time to

polish the beginning skills to allow math confidence to thrive.

References:

Immergut, Brita and Smith, Jean Burr. *Arithmetic and Algebra...Again*. McGraw-Hill, Inc., 1994.

MATH ANXIETY SYMPTOMS

" This is going to be so hard."

" There better not be any tests."

" I am not good at this stuff."

" I don't feel good."

" There is no way I can remember formulas."

" I am always the last one to figure out the answer."

Assessing Personal Math Anxiety

1. What are some of the anxieties/symptoms from the list that I personally can identify with?

_____

_____

_____

2. What are some of my own anxieties/symptoms that were not on the list?

_____

_____

_____

3. Why am I taking this course?

_____

_____

_____

_____

4. If I could conquer one fear about math, it would be:

_____

_____

5. I could do that by the following actions:

_____

_____

IDENTIFYING REALISTIC EXPECTATIONS

Learning Goals:

- Create a comfortable math setting
- Identify realistic class expectations
- List individual expectations

Level: ●

Group Size: Any

Time: 15 minutes

Preparation and Materials: Overhead *Realistic Expectations*

Learning Activity:

Students should be able to focus on and identify specific, concrete expectations that they want to achieve during the class. An overhead provides some typical examples. Discussion should also illustrate how some of these expectations can be measured.

***Discussion Questions**

1. What are some of the expectations we all have about this class?
2. What is the most important goal you want to achieve during this class?
3. What are some all-around goals we achieve by continuing our education?

***Variations** Instructor could begin class with an empty list of expectations and have students create the list from scratch.

Remarks: It is important for students to identify their personal expectations and goals for taking a class and for the instructors to take the time to become aware of them.

References:

Immergut, Brita and Smith, Jean Burr. *Arithmetic and Algebra...Again*. McGraw-Hill, Inc., 1994.

REALISTIC EXPECTATIONS

" I want to come to class and stay relaxed."

" I want to be able to multiply faster."

" I want to do well on a college placement test."

" I want to learn how to solve word problems."

" I want a miracle!"

BASIC MATH SKILLS SELF-ASSESSMENT

Learning Goals:
- Create a stress-free math assessment
- Introduce math "lingo"

Level: ●

Group Size: Any

Time: 5 - 10 minutes

Preparation and Materials: Handout *Student Evaluation of Mastery*

Learning Activity:

The students are presented with an evaluation listing various math concepts typically covered in a basic math class. Dialogue is established by the instructor by introducing the math terms that will commonly by used during the class with ample illustrations put on the board. Remember: many students have not used the words; whole numbers, place value, basic operations, etc., for a very long time.

***Discussion Questions**

1. Are there any other math terms you would like clarified?
2. Have your heard any of these math terms referred to by a different set of words?

***Variations** None

Remarks: It is very difficult to present a traditional pre-assessment tool to students taking their first adult math class. Anxieties are usually running high and just mentioning the word "test" can really invoke panic in some. This type of self-assessment allows for open discussion and board examples of the topics. It also allows the students to recognize their own strengths.

References: None

Student Evaluation of Mastery

Place an **I** next to topic areas you feel you need to improve on.
Place a **M** next to topic areas you feel you have mastered and are quite comfortable practicing.

____ Place values for large numbers

____ Place values for decimal numbers

____ Reading and writing numbers correctly

____ Rounding numbers

____ Estimating answers

____ Whole numbers: addition and subtraction

____ Whole numbers: multiplication and subtraction

____ Decimal numbers: addition and subtraction

____ Decimal numbers: multiplication and subtraction

____ Fractions: addition and subtraction

____ Fractions: multiplication and subtraction

____ Changing fractions to decimals

____ Changing decimals to fractions

M & M GAME

Learning Goals:

- Create a fun atmosphere with candy and number manipulation
- Establish a low anxiety level while working with numbers
- Explore various relationships between numbers

Level: ●

Group Size: Any

Time: 10 - 15 minutes

Preparation and Materials: 1 - 2 bags of M&M's candy or equivalent
Bowls for students to work from

Learning Activity:

Have each student take a handful of M&M's (the more the better). After everyone has taken some candy, have each student count the number of yellow candies. Continue with remaining colors and have students record this information on paper. (Helpful to illustrate data collection - possible two columns, one for color, one for number of candies.) When finished, have the students total the amounts. The students can then take turns finding the total for each color for the entire group.

***Discussion Questions**

1. How would we numerically represent the relationship between the number of yellow candies and the total number of candies?
2. Which relationship would give us the smallest decimal number?

***Variations** Instructor can use this activity with a variety of operations, including whole numbers, percentages, fractions, averages, etc. Instructors could also have each student or group of students create their own math questions.

Remarks: None

References: None

COUNTING AND ESTIMATING

Learning Goals:

- Create a comfortable math setting
- Tabulating sets of ten
- Re-enforcement of estimation skills

Level: ●

Group Size: Any

Time: 30 minutes

Preparation and Materials: Handout *Tally Sheet*
3 sets of small objects, i.e., beans, sugar cubes, beads, etc. for each group of students

Learning Activity:

Form groups of 2 to 4 people with each group receiving 100 units of Item A, 80 units of Item B, and 120 units of Item C. Each individual should receive their own tally sheet. Students first estimate which item has the most, the second most, and the least amount. Students then estimate how much there are of each amount. Students then count how many there are of each item by forming groups of ten. Record all data.

***Discussion Questions**

1. What are some of the various ways to record these amounts?
2. Which estimates were correct?
3. Is there a pattern to what type of estimates were correct?

***Variations** The group activity can be repeated as many times as desired by rotating items around so they vary from group to group.

Remarks: Repetition of estimation skills is a good concept to practice and is work related in terms of inventory, ordering supplies, production levels, etc. Expressing 80 as 8 (10)'s or 4 (20)'s leads to the relationship between multiplication and repeated addition.

References: None

Counting and Estimation Tally Sheet

Name of Counter: _____

Other Group Members: _____

_____

_____

	Item # 1	Item # 2	Item # 3
Description			
Estimate Most, 2nd Most, Least			
Estimation			
Actual Count			

When you have finished tallying, answer the following questions:

1. Which item did you estimate to have the most pieces? _____
2. Which item had the most pieces? _____
3. Which item had the least amount of pieces? _____
4. Were you correct in any of your estimations? _____

BEST COPY AVAILABLE

PROBLEM EXCHANGE

Learning Goals:

- To practice a particular math application in an enjoyable way
- To learn peer tutoring skills

Level: ●■▲

Group Size: 3 or more students

Time: 20 - 30 minutes

Preparation and Materials: None

Learning Activity:

Ask each of the students in the class to write down a math problem for the application the class has just finished studying (e.g. if the class has just finished learning addition of fractions with different denominators, each student will create a fraction addition problem such as $1/2 + 1/3 = ?$). Have the students pass the problem they have created to the student sitting to his/her right or left. The student who receives the problem must solve it. After the students have solved the problems, have them return the problem to the "creator" of the problem. This student must then correct the problem. If the problem is incorrect, have the students work together in pairs (the creator and the solver) to figure out where the error occurred.

***Discussion Questions** None

***Variations** Divide the class into two sections. Have each section prepare 5 or more problems for the other section. Exchange problems, return for corrections.

Remarks: This activity works well to practice any type of math application being discussed. Students really enjoy trying to come up with difficult problems for each other and the process of peer tutoring establishes a greater comfort level with asking one's peers for assistance.

References: None

UNDERSTANDING WORD PROBLEMS

Learning Goals:

- To understand the techniques of setting up and solving word problems

Level: ●■▲

Group Size: Any

Time: 30 - 45 minutes

Preparation and Materials: Handout *Problem Solving Strategies*

Learning Activity:

Discuss problems that arise at work that require math. Encourage students to think about problems that require more than one operation to solve. Illustrate on the board how these problems would be written as word problems and as mathematical sentences. Emphasize the importance of the correct wording. Illustrate how you write word problems. One technique discussed could be the following:

1. $3 + 6 = 9$
2. $3 + x = 9$
3. The sum of 3 and an unknown equals 9.
4. The sum of two numbers in which the second number is twice the first number equals nine.

***Discussion Questions**

1. Using the simple equation $7 + 8 = 15$, write 4 word problems.

***Variations** None

Remarks: Allowing students the opportunity to create their own word problems provides them with the experience to turn simple math statements into complicated, creative word problems. This technique of "working backwards" is a useful problem-solving strategy.

References: None

PROBLEM SOLVING STRATEGIES

- ☞ Understand the Entire Problem - Substitute Simple Numbers for Complex Numbers - Get a "Feel" for the Answer
- ☞ Draw a Diagram
- ☞ Make a List
- ☞ Create a Table
- ☞ Look for a Pattern
- ☞ Simplify the Problem
- ☞ Work Backwards
- ☞ Write an Equation
- ☞ Identify the Smallest Unknown
- ☞ Look for Relationships to the Smallest Unknown
- ☞ ALWAYS Plug in Your Answers to Check Your Original Equation

WHOLE NUMBERS

Working with Whole Numbers

Many people in today's society are quite comfortable working within a very narrow range of numbers - typically those found within 1 and 10,000. When we are confronted with numbers outside of this range, we tend to see more mistakes in reading and writing these values correctly as well as performing the basic operations. It is important to emphasize the "rules" for reading and writing numbers correctly and handouts within this section provide that opportunity.

IF I WON THE LOTTERY - COULD I READ THE PRIZE AMOUNT?

Learning Goals: • Learn how to properly read whole numbers

Level: ●

Group Size: Any

Time: 15 - 30 minutes

Preparation and Materials: Overhead *Reading the Number*

Learning Activity:

Begin the lesson, emphasizing that there are correct ways to read numbers and that the majority of our population performs this task incorrectly. You may want to use a visual illustrating names of the place values or have students create their own. The overhead provides a list of rules for reading numbers and well as numerous examples.

***Discussion Questions**

1. Does your job require you to read numbers over the telephone?
2. How should the number 1,000,028 be read?
3. How would you write that same number on a check?

***Variations** Practice with work-related invoices, inventories, quarterly report, etc.

Remarks: Frequently, students inject the word "and" when reading numbers aloud. Reading a list of numbers and having students write them down, usually illustrates how the word "and" becomes cumbersome. Certain occupations require reading numbers over the telephone and performing this task correctly is extremely beneficial to the recipient.

References: None

Reading the Number

707	Seven hundred seven.
925	Nine hundred twenty-five.
1,055	One thousand, fifty-five.
10,040	Ten thousand, forty.
52,708	Fifty-two thousand, seven hundred eight.
70,011	Seventy thousand, eleven.
210,804	Two hundred ten thousand, eight hundred four.
602,508	Six hundred two thousand, five hundred eight.
999,099	Nine hundred ninety-nine thousand, ninety-nine.

4,087,533	Four million, eighty-seven thousand, five hundred thirty-three.
20,789,006	Twenty million, seven hundred eighty-nine thousand, six.
406,712,084	Four hundred six million, seven hundred twelve thousand, eighty-four.
500,036,899	Five hundred million, thirty-six thousand, eight hundred ninety-nine.
8,789,567,230	Eight billion, seven hundred eighty-nine million, five hundred sixty-seven thousand, two hundred thirty.

Reading Rules:

- Do not use the word "and"

- When you see a comma, a family name is used - billions, millions, thousands

- Though there is no comma after the hundreds place - use the word hundred

WRITING WHOLE NUMBERS CORRECTLY

Learning Goals: • How to properly write whole numbers

Level: ●

Group Size: Any

Time: 15 - 30 minutes

Preparation and Materials: Handout *Writing the Number*

Learning Activity:

It is recommended that this lesson follows a lesson on place value and/or the enclosed activity entitled If I Won the Lottery, Could I Read the Prize Amount?. The rules for correctly writing numbers appear on the top of the handout so they are readily available for student use.

***Discussion Questions** **1.** How would we write the number 8,023?

***Variations** Practice with work-related invoices, inventories, quarterly reports, etc. Practice by writing checks correctly. Read a list of numbers verbally.

Remarks: If students have difficulty in writing a large number, i.e. six million, forty-four, demonstrate the following technique: the family name of million tells us that there are 6 spaces to follow, hence we could begin by writing the number as: 6,_ _ _, _ _ _.
Now we fill in the number 44 beginning from the ones column: 6, _ _ _, _ 44.
Fill in remaining spaces with zeros: 6,000,044.
Same applies to seven hundred thousand, six. The family name of thousand tells us that there are 3 spaces to follow:

Step 1: 700,_ _ _
Step 2: 700,_ _ 6
Step 3: 700,006

References: None

Handout: Writing the Number

Rules for Writing Numbers:

- When you hear a family name, i.e. billions, millions, thousands, insert a comma.
- When you see a comma, name the family.
- Use a hyphen when writing any number between twenty-one and ninety-nine.
- Do not use the word "and" when writing whole numbers.

For the following examples, write out the written form for the number indicated.

1. 1,301 _____

_____

2. 10,078 _____

_____

3. 80,030 _____

_____

4. 304,700 _____

_____

5. 175,030 _____

_____

6. 22,014,003 _____

_____

7. 90,090,900 _____

_____

8. 101,011,001 _____

_____

9. 23,003,400,055 _____

_____

10. 700,808,079,800 _____

_____

For the following examples, write out the number form for the number indicated.

11. Seventy-two thousand, sixty.

_____

12. Fourteen thousand, two hundred, twelve.

_____

BEST COPY AVAILABLE

13. Seven hundred three thousand, four hundred.

_____

14. Sixteen million, thirty-eight.

_____

15. 7 million, 7 thousand, 7 hundred.

_____

PLACE VALUE ASSESSMENT

Learning Goals:

- Provide a comprehensive assessment on place values for whole numbers
- Compare whole numbers using signs of equality and inequality

Level: ●

Group Size: Any

Time: 30 minutes

Preparation and Materials: Handout *Place Value Assessment*

Learning Activity:

Prior to handing out the assessment, illustrate on the board signs of equality and inequality and how we use them.

***Discussion Questions** None

***Variations** None

Remarks:

References:

Handout: Place Value Assessment

Directions: Write the value of each underlined digit.

1. 1<u>4</u>6 _____

2. 2,<u>3</u>45 _____

3. 1<u>6</u>7,498 _____

4. 86,9<u>0</u>1 _____

5. <u>4</u>80,324 _____

6. 1<u>4</u>,601 _____

7. <u>2</u>1,456,079. _____

8. <u>7</u>85,321 _____

9. 5<u>5</u>,655,201 _____

10. 100,<u>9</u>09 _____

11. The name for the number: 201,948,050 in words is:

_____

_____

12. The number whose name is one hundred twenty-three billion, forty million, nine is written in digits as:

_____

The following symbols: > , < , and = are used when comparing numbers.

> means greater than; the first number is greater than the second number.

< means less than; the first number is less than the second number.

= means equal to; the first number has the same value as the second number.

Using the greater than, less than, and equal symbols, complete the following statements.

13. 5,067 _____ Five thousand, six hundred seven.

14. one million, seventy-six thousand _____ 1,760,000

15. 17,506 _____ seventeen thousand, five hundred six.

16. four hundred eighteen thousand _____ 4,018,000

17. 202,020 _____ twenty-two thousand, twenty.

18. six billion _____ 6,000,000

WRITING MATHEMATICAL SENTENCES

Learning Goals:
- Link key words with the correct math operation

Level: ●

Group Size: Any

Time: 15 - 30 minutes

Preparation and Materials: Overhead *Key Words and Phrases*
Handout *Writing Mathematical Sentences*

Learning Activity:

The overhead illustrates the many ways the 4 basic math operations can be described. The handout provides examples of a variety of mathematical sentences and word problems. This allows students the opportunity to translate words and symbols to the proper operation.

***Discussion Questions**

1. Are there any other examples?
2. How would we write 14 minus 6?
3. How would we write 6 less than 14?

***Variations** This could easily be presented as a group activity. Instructors may also want to present math sentences using an unknown and thus introduce the use of a variable. For example: some number less than 8.

Remarks: This activity allows students to start breaking down word problems that many consider laborous.

References: None

Key Words and Phrases for the 4 Basic Operations

Key Words and Phrases Meaning Addition	Key Words and Phrases Meaning Subtraction
+ added to plus sum total increased by an increase of more than with a gain of addends	- subtracted from difference of minus less than decreased by take away loss of subtrahend
Key Words and Phrases Meaning Multiplication	**Key Words and Phrases Meaning Division**
x multiplied by product product of two factors times of at repeated addition multiplicand (2)(3) 2(3) 2 · 3 2 @ 3.00 2[3(2)] exponential powers	÷ divided by divided into quotient how many of one number is in another in equal parts fraction bar what are the factors of dividend divisor

Remember: There are always exceptions to the guidelines above.

Writing Mathematical Sentences

Directions: For the following math statements and word problems, first write down the proper math sentence using the correct basic operation. Then solve the problem.

1. What is the sum of 16, 38, 24, and 12? 2. What are two sets of factors for 35?

3. What is the quotient of 96 and 4?

4. What is 44 less than 89?

5. $14(2) \div 7$

6. $10 \cdot 4$ increased by 16

7. Stephanie earns $180 a week. She works 3 days a week. How much money does she earn in one day? If she works 4 hours a day, how much does she make an hour?

8. Every week Jeff loads 44 crates of inventory for the hospital. Each crate holds 12 boxes but due to a shortage of supplies this week, Jeff could only ship 40 crates. The hospital received how many less boxes than usual?

FRACTIONS - DECIMALS

Fractions and Decimal Numbers - Bit-by-Bit

The section on "number parts" was intentionally separated from the section on whole numbers to provide instructors with activities based only on whole numbers before the introduction of fractions and decimal numbers occurs. As with whole numbers, students are typically very comfortable with a certain range of decimal numbers, specifically the place values of tenths and hundredths due to our monetary system. Though most of our society likes to run and hide from fractions and basic operations involving fractions, we as instructors know how vital fractions are in our everyday life as well as our workplace environment. Activities dealing with decimal place value and use of fractions are contained within this section. Additional activities also explore the use of percents and their role as decimal numbers.

READING DECIMAL NUMBERS

Learning Goals: • Learn how to properly read decimal numbers

Level: ●

Group Size: Any

Time: 15 - 30 minutes

Preparation and Materials: Overhead *Decimal Place Values*
Overhead *Reading Decimal Numbers*

Learning Activity:

Begin with the overhead, *Decimal Place Values*. Emphasize the "th" ending. Illustrate that to read a decimal number, it is helpful to count the number of spaces the decimal number occupies to the right of the decimal point. Then link this with the name of the whole number that has the same number of zeros. Add the "th" ending and you have the proper value of the decimal number. For example:

0.017 - occupies 3 spaces - whole number with 3 zeros is thousand. Therefore the number is read as seventeen thousandths.

0.00006 - number occupies 5 spaces - whole number with 5 zeros is hundred-thousand. Therefore number is read as 6 hundred-thousandths.

***Discussion Questions** 1. None

***Variations** None

Remarks: Most students are very comfortable with working with decimal numbers through the hundredths place due to our monetary system. Difficulties usually lie in the smaller place values.

References: None

Decimal Place Values

0. $\underline{*}$	tenths place
0. $_\underline{*}$	hundredths place
0. $__\underline{*}$	thousandths place
0. $___\underline{*}$	ten-thousandths place
0. $____\underline{*}$	hundred-thousandths place
0. $_____\underline{*}$	millionths place

Reading Decimal Numbers

- Use the word "and" where the decimal point is located
- Read decimal place values with a "th" ending

6.8	Six and eight tenths
1.01	One and one hundredth
0.999	Nine hundred ninety-nine thousandths
22.015	Twenty-two and fifteen thousandths
100.0909	One hundred and nine hundred nine ten-thousandths
0.00697	Six hundred ninety-seven hundred-thousandths
0.000089	Eighty-nine millionths

WRITING DECIMAL NUMBERS

Learning Goals: • How to properly write decimal numbers

Level: ●

Group Size: Any

Time: 5 - 15 minutes

Preparation and Materials: None

Learning Activity:

Once students have reviewed place values names, they should practice the skill. Instructors should verbally read the following list and have students write the numbers down on a piece of paper.

1.) 0.14	4.) 1,004.04	7.) 72,000.072
2.) 99.9	5.) 103,056.008	8.) 0.0060
3.) 100.001	6.) 0.00001	9.) 0.7001

***Discussion Questions** **1.** None

***Variations** Students could create their own list of numbers and practice reading and writing numbers in small groups.

Remarks: None

References: None

PIZZA PIE AND FRACTIONS

Learning Goals:

- To introduce the concept of fractions including the terms "numerator" and "denominator"
- To help students identify how often they need to use fractions in everyday life

Level: ●

Group Size: 3 or more students

Time: 20 minutes

Preparation and Materials: 3 cardboard "pizza pie" circles; one divided into halves, one divided into fourths, the third divided into eighths.

Learning Activity:

Ask students, "How hungry are you at the end of the day?" Place the cardboard pizzas in front of the students in their whole form. Give each student a different sized piece of pizza. Ask them if that amount of pizza will be enough to satisfy their hunger. Some with larger pieces, (i.e. 1/2) may answer "yes", while those with smaller pieces (i.e. 1/8) may answer "no". Ask them to explain why they are not all satisfied if they all received one piece. (The pieces are of different sizes and all represent different fractions.) See if the students are able to explain what each size of pizza represents in fractional form. Explain the terms numerator and denominator. The denominator tells us how many equal pieces we cut the pie into; the numerator tells us how many of those pieces we have. Select different slices and ask students to write what fraction is being represented.

***Discussion Questions**

1. Where else do we use fractions?

***Variations** None

Remarks: The importance of making fractions "real" to students cannot be overemphasized. Making a connection between fractions in number form and what they represent in the physical world is the crucial first step.

References: None

UNDERSTANDING IMPROPER FRACTIONS

Learning Goals:

- To give students an understanding of what an improper fraction represents
- To allow students to practice re-writing improper fractions

Level: ■

Group Size: Any

Time: 20 minutes

Preparation and Materials: Handout *Improper Fractions*

Learning Activity:

Give students several copies of the *Improper Fractions* handout. Write an improper fraction on the board and then ask them to divide the milk bottles into the number represented by the denominator (e.g. for the improper fraction 5/4, they would divide all of the milk bottles into four equal pieces.) Now ask the students to fill in the number of pieces represented by the numerator. After creating this visual representation of the improper fraction, have the students rewrite the improper fraction as a mixed number (e.g. 1 1/4.) After performing this sequence for several improper fractions, you may want to show students the "short cut" for rewriting improper fractions as mixed numbers (i.e. divide the denominator by the numerator to get the whole number, the remainder goes over the denominator.)

*** Discussion Questions** None

*** Variations:** You may want to have the students choose an object (e.g. burritos, cans of beer, etc.) which they can draw first on blank paper and then divide up to show the improper fraction.

Remarks: For many students, the idea that an improper fraction represents a number larger than one may be hard to conceptualize. This activity really helps to make that idea clear.

References: None

Improper Fractions

Improper fraction _____ Mixed number _____

Improper fraction _____ Mixed number _____

Improper fraction _____ Mixed number _____

EPIC Workplace Learning Project. 1996
US Department of Education

BEST COPY AVAILABLE

MEASURING TEAMS

Learning Goals:
- To practice addition of fractions
- To work in teams and practice peer tutoring

Level: ■

Group Size: 4 or more students

Time: 15 - 30 minutes

Preparation and Materials: Measuring tapes (1 for every 2 students)

Learning Activity:

After having taught addition of fractions with like and unlike denominators, divide class into pairs or teams of three. Have the class select what they think is the "ugliest" thing in the room. Have each team measure the length and width of this object and record these measurements. Have them add the measurements together and check their answers with their teammates. Continue by having the class add the length and width of other objects in the room such as biggest, widest, darkest, longest, etc.

***Discussion Questions**
1. Is it possible to add fractions with unlike denominators?

***Variations** Students could subtract the shorter distance from the longer distance.

Remarks: Students may first need a short lesson on how to read a tape measure. This activity works especially well in workplace environments where measuring is an integral part of daily work responsibilities..

References: None

BEST COPY AVAILABLE

SIGNS, SIGNS, EVERYWHERE ARE SIGNS: DROPPING PERCENT SIGNS

Learning Goals: • Convert percentage rates to decimal numbers

Level: ●

Group Size: Any

Time: 10 - 15 minutes

Preparation and Materials: Handout *Percents to Decimals*

Learning Activity:

When we are given the percentage rate (i.e. 80%, 50%), we need to be able to properly convert the percent to a decimal number for our mathematical sentence. Basically, when we see a rate such as 16%, mathematically it means 16 per 100 or 16 ÷ 100. Therefore we can convert 16% to the decimal number 0.16. A simple rule to follow is:

→ Drop the Percent Sign (%)
→ Divide by 100 - this is also achieved by moving the decimal point 2 places to the LEFT

***Discussion Questions**

1. What is 25 divided by 100? Is the same value achieved by moving the decimal point in 25 two places to the left?

2. What is 10.5 divided by 100? Is the same value achieved by moving the decimal point in 10.5 two places to the left?

***Variations** None

Remarks: Common mistakes occur in converting percentage rates that include a decimal number or fractional part.. For example ½% very commonly will be written as 0.5 in the mathematical sentence versus the correct answer of 0.005. Remind students to always convert fractions to decimal numbers first.

References: None

Handout: Percents to Decimals

Directions: Convert the follow percentage rates to decimal numbers.

- Drop the Percent Sign %
- Move the Decimal Point TWO Places to the LEFT (Divide by 100)

Percentage Rate	Drop the Sign	Move the Point
275%		
150%		
100%		
90.9%		
88%		
75%		
55.5%		
38%		
22.4%		
16%		
6%		
1.05%		
0.75%		
½%		
0.01%		

ADDING PERCENT SIGNS

Learning Goals: • Convert decimal numbers to percentage rates

Level: ●

Group Size: Any

Time: 10 - 15 minutes

Preparation and Materials: Handout *Decimals to Percents*

Learning Activity:

When we need to calculate the percentage rate, our math leads us to a decimal number. For example, after the math we might end up with a number like 0.88 which is read as eighty-eight hundredths which mathematically means 88 per hundred. This can be changed into a percentage rate by multiplying by 100. A simple rule to follow is:

→ Multiply by 100 - this is also achieved by moving the decimal point 2 places to the RIGHT
→ Add the Percent Sign (%)

***Discussion Questions**

1. What is 0.25 multiplied by 100? Is the same value achieved by moving the decimal point in 0.25 two places to the right?

2. What is 0.105 multiplied by 100? Is the same value achieved by moving the decimal point in 0.105 two places to the right?

***Variations** None

Remarks: Common mistakes occur in converting decimal numbers to percentage rates when the decimal number is larger than 1.0. For example 16 very commonly will be written as 16% as the calculated percentage rate versus 1600%.

References: None

Handout: Decimals to Percents

Directions: Convert the follow calculated rates to percentage rates. Rates like those listed are calculated when percent problems give us the values of the base and amount.

- Move the Decimal Point TWO Places to the RIGHT (Multiply by 100)
- Add the Percent Sign %

Calculated Rate	Move the Point	Add the Sign
10.5		
6.5		
1.75		
1		
0.99		
0.905		
0.7056		
0.444		
0.3		
0.11		
0.088		
0.05		
0.01		
0.005		
0.0001		

PERCENTAGE POWER

Percentage Power

Though most of us are able to calculate basic percent problems on our calculators, many of us have forgotten the "math" that leads us to the correct answer. Though none of the activities found within this section emphasize the use of calculators, instructors should feel free to introduce their use at any appropriate time. It is usually beneficial to employ a variety of techniques when teaching percent formulas as you will find that your students were initially taught by a variety of styles.

WORKING WITH PERCENTS

Learning Goals:

- Recognize that there are 3 different basic percent formulas

Level: ●

Group Size: Any

Time: 15 -30 minutes

Preparation and Materials: Handout *3 Types of Percent Problems*

Learning Activity:

Illustrate the 3 basic types of percent problems on the board as word problems. Emphasize that in a simple percent problem, 2 of the 3 parts necessary to calculate the answer are known. Relate this knowledge with division being the inverse operation of multiplication. Demonstrate with the example: (2)(3) = 6. If we know 2 and 3 we can calculate 6, therefore if we know 2 and 6 we can determine 3 by the inverse operation of division.

***Discussion Questions**

1. In percent problems, how do the words "of" and "is" help us?
2. Is the amount (A) always less than the base (B)?

***Variations** None

Remarks: This is a nice lead in to the use of variables. Since we have two know values and one unknown value we can introduce the use of variables. Emphasize that in a lengthy word problem, the percentage problem can be restated in short clause like form. Example: There are 45 students taking this class, 10 of them are females. What percent of the students are female? This can be restated as the simple phrase: 10 is what percent of 45?

References: None

3 TYPES OF PERCENT PROBLEMS

Word Example	Number Example	Formula	Solution
Some percent of **some** number equals what number? Solve by Multiplication	25% of 16 is what number?	(R)(B)=A	
Some percent of what number equals **some** number? Solve by Division	25% of what number equals 4?	B = A ÷ R	
What percent of **some** number equals **some** number? Solve by Division	What % of 16 equals 4?	R = A ÷ B	

RULES:

To express a decimal number as a percent it needs to be multiplied by 100% - MOVE the decimal point two places to the right.

Example: .45 becomes 45% (.45)(100) = 45% add the percent sign

To convert a percent into a decimal, divide by 100 - MOVE the decimal point two places to the left.

Example: 45% becomes .45 45 ÷ 100 = .45 drop the percent sign

EPIC Workplace Learning Project, 1996
US Department of Education

55

CALCULATING THE AMOUNT

Learning Goals:

- Calculate the amount given the percentage rate and base

Level: ■

Group Size: Any

Time: 30 minutes

Preparation and Materials: Handout *Calculating Amounts*

Learning Activity:

One of the most common types of percentage problems that consumers are faced with today concern calculating amounts, for example: final price on a sale item, amount of downpayment, etc. Discuss that this is one of the easiest types of percentage problems because the operation of multiplication is used. Therefore the order of factors does not effect the product (6% x 20 = 20 x 6%).

***Discussion Questions**

1. What type of information do we need to know to calculate an amount?
2. List work-related examples of calculating amounts. List consumer-related examples of calculating amounts.

***Variations**

Sales flyers, paychecks, and tax tables provide numerous percentage rates and bases that can be used to set up mathematical problems.

Remarks:

Sometimes it is appropriate to illustrate examples where the remainder is easier to calculate than the amount. For example, 90% off a $27.80 item is much more difficult to calculate than 10% off a $27.80 item.

References:

None

CALCULATING AMOUNTS

1. Calculate 15% of 75:

2. Calculate 6.5% of 125:

3. Calculate 115% of 20:

4. A home in my neighborhood is selling for $135,000. The real estate agent will receive a 7% commission on the listing and sale of the home. How much will the real estate agent receive?

5. To purchase the car of my dreams at Sam's Auto Lot, I need to put down a 15% down payment. If my car is priced at $7,250, what is my down payment?

6. My insurance policy covers 80% of my prescription costs. How much would I need to pay for a $44.00 prescription?

2 OUT OF 12 STUDENTS FALL ASLEEP DURING CLASS - CALCULATING RATES

Learning Goals: • Calculate percentage rates

Level: ■

Group Size: Any

Time: 30 minutes

Preparation and Materials: None

Learning Activity:

Bring to class numerous examples of advertising that present the consumer with the values of the bases and amounts. For example, 3 out of 4 people prefer Brand X, 4 out of 5 dentists, 7 out of 10 car owners, etc. Illustrate how this type of information can be mathematically represented as fractions, i.e., 3/4, 4/5, and 7/10. From this, the division problem has been set up (numerator divided by denominator) and we are able to calculate the rate. Remember, this math leads us to a decimal number which then must be converted to a percentage rate by multiplying by 100 and adding the percent sign. Be sure to mention that the numerator is the amount and the denominator is the base and that illustrates that Rate = Amount ÷ Base. Have students provide their own examples.

***Discussion Questions**

1. What % of students taking this class are females?
2. What % of students taking this class are wearing sneakers?
3. What % of males in the class are wearing denim?

***Variations**

Provide students with an example where amounts are given but before the rate can be determined, the base needs to be calculated by finding the sum of amounts. For example: The Colorado Avalanche team has 22 players from Canada, 12 players from the United States, and 6 players from Scandinavian countries on their team roster. What percent of the players are from the United States?

Remarks: Mention to students that if they are working with a percent word problem and they are having a hard time determining which value is the amount and which value is the base, see if rewording the problem into a "3 out of 4" type of statement leads them to the correct formula.

References: None

CALCULATING THE BASE

Learning Goals:

- Calculate the base given the percentage rate and amount

Level: ■

Group Size: Any

Time: 30 minutes

Preparation and Materials: Handout *Calculating Bases*

Learning Activity:

One of the least common types of percentage problems that consumers are faced with today concern calculating the original base. Therefore, students usually have less experience with this type of percentage problem. Because this type of calculation involves division, it is essential that the math sentence is set up properly.

***Discussion Questions**

1. What type of information do we need to know to calculate a base?
2. List work-related examples of calculating bases. List consumer-related examples of calculating bases.

***Variations** None.

Remarks: It is helpful to point out to students that one way to check their answer is to remember the following:

If the rate ‹ 100%, the base is › amount.
If the rate › 100%, the base is ‹ amount.

References: None

CALCULATING BASES

1. 10% of what number is 7.5?

2. 60% of what number is 3?:

3. 200% of what number is 100?

4. ½% of what number is 10?

5. My bank offers an interest rate of 3.5% interest on savings accounts. If I want to make at least $50 in interest, how much money should I deposit?

6. The M&J Company spent $8250 advertising on the radio last year. This represents 12.5% of their total advertising budget. How much did the M&J Company budget for all of their advertising costs?

BEST COPY AVAILABLE

USING ALL 3 BASIC PERCENT FORMULAS

Learning Goals:

- Application of the 3 basic percent formulas using math sentences and word problems

Level: ■

Group Size: Any

Time: 30 minutes

Preparation and Materials: Handout *Percent Formulas*

Learning Activity:

Once students have reviewed the 3 basic percent formulas individually, it is essential that they master the skill of applying the correct formula when all 3 types of percent problems are given.

***Discussion Questions**

1. Which formula(s) use multiplication?
2. Which formula(s) use division?.

***Variations** None.

Remarks: One skill that is useful in this type of handout (one where numerous formulas are employed) is to search out all the problems that use one formula and calculate those before moving on to the second and third formula.

References: None

Handout: Percent Formulas

For the following percent problems, apply one of the three basic percent formulas to calculate the correct answer.

1. Calculate 22.5% of 160:

2. 50% of what number is 13.5?

3. What percent of 40 is 20?

4. ½% of what number is 1?

5. 2 is what percent of 12?

6. 12 is what percent of 2?

7. Three-fourths percent of 10 is what number?

8. During my class, 16 students out of 52 students arrived late due to a snowstorm. What percent arrived on time?

9. My health plan covers 85% of my hospital costs. My final bill for liposuction was $3,890. What amount is covered by insurance?

10. Debbie's pays $650 a month for rent. This represents 25% of her monthly income. What is her total monthly income?

11. My pharmacy plan covers 80% of my prescription costs. How much will I owe on a $25.00 prescription?

12. Neal's softball team won 60% of their games last season. How many games did they play if their win record was 21 games?

13. If you received a $120 raise on a monthly salary of $1,600, what percent raise did you receive?

Answer Sheet:

1. (Rate)(Base) = Amount — Answer: 36
   (22.5%)(160) = Amount
   (.225)(160) = 36

   Helpful Hint: 25% of 160 is the same as one-fourth of 160 or 40
   22.5% is less than 25% and 36 is less than 40, so answer appears good.

2. Base = Amount ÷ Rate — Answer: 27
   Base = 13.5 ÷ 50%
   Base = 13.5 ÷ 0.5
   Base = 27

   Helpful Hint: 50% of a number is also 1/2 of the number, so answer can also be calculated by multiplying 13.5 by 2.

3. Rate = Amount ÷ Base — Answer: 50%
   Rate = 20 ÷ 40
   Rate = 0.5 (multiply by 100, add sign)
   Percentage Rate = 50%

   Helpful Hint: This sentence can also be read as 20 out of 40 is what?

4. Base = Amount ÷ Rate — Answer: 200
   Base = 1 ÷ ½%
   Base = 1 ÷ 0.5%
   Base = 1 ÷ 0.005 (drop the sign, divide by 100)
   Base = 200

   Helpful Hint: Convert fractions to decimal numbers before you change the percentage rate to a decimal number.

5. Rate = Amount ÷ Base — Answer: 16.67%
   Rate = 2 ÷ 12
   Rate = 0.16666
   Percentage Rate = 16.67%

6. Rate = Amount ÷ Base — Answer: 600%
Rate = 12 ÷ 2
Rate = 6
Percentage Rate = 600% — Common error: answer of 6%

7. (Rate)(Base) = Amount — Answer: 0.075
(0.75%)(10) = Amount
(0.0075)(10) = 0.075

Common error: (0.75)(10)= 7.5
Helpful Hint: Three-fourths percent is a very small number - less than 1!

8. Rate = Amount ÷ Base — Answer: 69%
Rate = (52 - 16) ÷ 52
Rate = 36 ÷ 52
Rate = .6923
Percentage Rate = 69%

OR: 16 ÷ 52 = 31% Percent of students arriving late. Therefore percent of students arriving on time: 100% - 31% = 69%

9. (Rate)(Base) = Amount — Answer: $3,306.50
(85%)(3,890) = Amount
(0.85)(3,890) = 3,306.5

10. Base = Amount ÷ Rate — Answer = $2,600
Base = 650 ÷ 25%
Base = 650 ÷ 0.25
Base = 2,600

Helpful Hint: Answer could also be calculated as 650 represents 25% (¼) of what number? or (4)(650) = 2600

11. (Rate)(Base) = Amount — Answer: $5.00
(80%)(25.00) = Amount
(0.08)(25.00) = 5.00

Helpful Hint: 20% of 25.00 leads us to the answer easier.

12. Base = Amount ÷ Rate
Base = 21 ÷ 60%
Base = 21 ÷ 0.60
Base = 35

Answer: 35 games

13. Rate = Amount ÷ Base
Rate = 120 ÷ 1600
Rate = 0.075
Percentage Rate = 7.5%

Answer: 7.5%

WHAT'S MY PAY?

Learning Goals: • Calculate paychecks

Level: ■

Group Size: Any

Time: 30 minutes

Preparation and Materials: Pay stubs (students bring their own if possible)
Accounting information (FICA, STATE, etc.)

Learning Activity:

Using their own pay stubs or one given to them by the instructor, have students figure out the percentages of taxes withheld. Students can figure the percentage of each specific item withheld, i.e. insurance, 401k plans, union dues, etc.

***Discussion Questions**

1. What overall percent is taken out of your paycheck?

2. If you decided to set aside for savings 15% of your gross pay, what would your take home pay be?

***Variations** Have beginning students multiply their hourly rate by the number of hours to check for accuracy. Advanced students can create a bar graph showing deductions by percentages.

Remarks: None

References: None

EPIC Workplace Learning Project, 1996
US Department of Education

SHOPPING THE SALES

Learning Goals:
- Calculate percentage rates
- Calculate final prices

Level: ■

Group Size: Any

Time: 30 - 45 minutes

Preparation and Materials: Local newspaper advertisements

Learning Activity:

Distribute advertisements to each student. Students are asked to figure the sale amount for 3 - 5 items. Supply students with the original price and discounted prices of various items. Have students calculate the percent of savings.

***Discussion Questions**

1. What is the sales tax in our city?
2. Which is a better savings, 10% off or $10 off a $50 item?

***Variations** Students may work in groups or with a partner to design an advertisement using different sale percentages.

Remarks: None

References: None

BEST COPY AVAILABLE

LOOKING AT YOUR BUDGET

Learning Goals: • Design and analyze a household budget

Level: ■

Group Size: Any

Time: 30 - 45 minutes

Preparation and Materials: None

Learning Activity:

Students are given an imaginary amount of annual income and asked to budget expenses for the upcoming year. Categories can include food, housing, savings, auto expenses, insurance, entertainment, etc. Percentages can be calculated annually as well as monthly. Students can also use their checkbooks as a quick reference to monthly expenses.

***Discussion Questions**

1. What is the highest percentage of money spent on? Lowest?

***Variations** None

Remarks: None

References: None

FREQUENCY DISTRIBUTIONS

Learning Goals: • To convert frequency distributions into percents

Level: ▲

Group Size: Any

Time: 30 minutes

Preparation and Materials: Handout *Reading the Paper*

Learning Activity:

Using the handout displaying the numbers of which section of the newspaper do people read first, students are able to calculate the base amount (total). Once we know the base amount and individual amounts, rates can be calculated.

***Discussion Questions**

1. What are the three parts to a percent formula? What do we know? What do we need to figure out?

2. If we have 8 female students in our class and 6 male students, what percent of the total number of students are female?

***Variations** Using a variety of categories, students can devise their own frequency distributions.

Remarks: A nice follow-up lesson would be to create pie charts using the data. It should also be noted that frequently percent figures are rounded, therefore a total percent figure may be greater than or lesser than 100%. Typically, reports indicate such with a disclaimer statement.

References: None

Reading the Paper

Categorical data is often summarized by creating frequency distributions (how many people did what). To make this type of information more meaningful, it is appropriate to convert frequencies into percents.

Sample of people on my street as to which part of the paper they read first:

Section of Paper	Frequency	Percent
Sports Page	21	
City News	37	
Front Page	115	
Dear Abby	16	
Totals:		

1. What is the base amount: _____

2. What is the unknown: _____

3. What is the basic percent formula: _____

4. Plug in the values we know for the sports page: ( )( ) = ( )

5. Isolate the unknown and complete the math:

6. Complete the table.

INEDIBLE PIES: MAKING PIE CHARTS

Learning Goals:

- Create pie charts from frequency distribution information

Level: ■

Group Size: Any

Time: 30 minutes

Preparation and Materials:
Protractor
Overhead *Calculating Slices*
Handout *Creating Pie Charts*

Learning Activity:

Provide students with a protractor and the handout. A short lesson on using the protractor may be necessary. Explain that when we are given categorical or frequency distribution data, we can represent this visually as a pie chart. First, the total base amount needs to be calculated. From this, the individual percentage rates can be determined. It is usually important to note that due to rounding, total percentage rates may add up to more than 100%. Once the percentage rates are calculated, pie slices can be created.

***Discussion Questions**

1. List examples of when data can be appropriately displayed in pie chart form.
2. Are there times when a pie chart is not useful to the reader?

***Variations**

From an existing pie chart have students calculate the value of individual amounts. Annual reports published by companies usually contain many examples of pie charts.

Remarks:

Pie charts are very useful as a visual tool in conveying information to the audience. They are typically most useful when 5 or less parts are being compared. When more then 5 parts are being created or when the differences between parts are very small, the benefits of using pie charts is diminished.

References:

None

CALCULATING SLICES

Example: 50 people wore red
75 people wore white

Step 1: Determine Individual Percentage Rates

Total Base Amount: $50 + 75 = 125$

Percentage Rate for Red: Rate = Amount ÷ Base

Rate = 50 ÷ 125
Rate = 0.40
Percentage Rate = 40%

Percentage Rate for White: Rate = Amount ÷ Base

Rate = 75 ÷ 125
Rate = 0.60
Percentage Rate = 60%

Step 2: Determine Slices

Multiply Percentage Rates by 3.6

Red: (40)(3.6) = 144°
White (60)(3.6) = 216°

Handout: Creating Pie Charts

Directions: From the data below, construct visually-appealing pie charts.

1. Exit interviews were conducted on 1,200 voters on why they voted for Congressmen Jones. Draw a pie chart to display their answers:

Because of his conservative views:	544
Because of his views on foreign policy:	296
Because of his party-affiliation:	360

2. In the United States, there are 340 art museums, 683 history museums, 284 science museums, 186 art museums, and 328 other museums. Construct a pie chart of this categorical information.